

inch. Precipitation, ne. quadrant, five stations; se. quadrant, no reports; sw. quadrant, none; nw. quadrant, none.

24th, 7 a. m. Position, *east of New Orleans*: Departure, —.31 inch. Precipitation, ne. quadrant, six stations; se. quadrant, one station; sw. quadrant, none; nw. quadrant, one station.

3 p. m. Position, *west Florida*: Departure, —.26 inch. Precipitation, ne. quadrant, four stations; se. quadrant, none; sw. quadrant, three stations; nw. quadrant, none.

10 p. m. Position, *southern Georgia*: Departure, —.30 inch. Precipitation, ne. quadrant, four stations; se. quadrant, none; sw. quadrant, three stations; nw. quadrant, one station.

25th, 7 a. m. Position, *central North Carolina*: Departure, —.50 inch. Precipitation, ne. quadrant, nine stations; se. quadrant, one station; sw. quadrant, seven stations; nw. quadrant, nine stations.

3 p. m. Position, *off Delaware coast*: Departure, —.64 inch. Precipitation, ne. quadrant, seven stations; se. quadrant, no reports; sw. quadrant, eleven stations; nw. quadrant, twenty-seven stations.

10 p. m. Position, *off Massachusetts coast*: Departure, —.64 inch. Precipitation, ne. quadrant, five stations; se. quadrant, no reports; sw. quadrant, twenty-four stations; nw. quadrant, sixteen stations.

26th, 7 a. m. Position, *Gulf of Saint Lawrence*: Departure, —.94 inch. Precipitation, ne. quadrant, no reports; se. quadrant, three stations; sw. quadrant, nineteen stations; nw. quadrant, no reports. From this region the depression moved thence eastward to the Atlantic.

XI.—24th, 3 p. m. Position, *British Columbia*: Departure, —.09 inches. Precipitation, ne., se., and nw. quadrants, none; sw. quadrant, four stations.

10 p. m. Position, *Province of Assiniboia, British America*: Departure, —.30 inch. Precipitation, ne. quadrant, two stations; se. quadrant, none; sw. quadrant, two stations; nw. quadrant, none.

25th, 7 a. m. Position, *northwest Dakota*: Departure, —.52 inch. Precipitation, ne. quadrant, none; se. quadrant, three stations; sw. quadrant, none; nw. quadrant, one station.

3 p. m. Position, *central Nebraska*: Departure, —.12 inch. Precipitation, ne. quadrant, seven stations; se. quadrant, none; sw. quadrant, none; nw. quadrant, two stations. During the day the depression filled up and disappeared in the lower Missouri valley.

XII.—27th, 3 p. m. Position, *Province of Assiniboia, British America*: Departure, —.04 inch. Precipitation, in all quadrants, no reports.

10 p. m. Position, *northwest Dakota*: Departure, —.28 inch. Precipitation, ne. quadrant, three stations; se. quadrant, one station; sw. quadrant, none; nw. quadrant, none.

28th, 7 a. m. Position, *southeast Dakota*: Departure, —.35 inch. Precipitation, ne. quadrant, five stations; se. quadrant, four stations; sw. quadrant, none; nw. quadrant, five stations.

3 p. m. Position, *east Iowa*: Departure, —.51 inch. Precipitation, ne. quadrant, nineteen stations; se. quadrant, three stations; sw. quadrant, one station; nw. quadrant, four stations.

10 p. m. Position, *Lake Michigan*: Departure, —.49 inch. Precipitation, ne. quadrant, ten stations; se. quadrant, four stations; sw. quadrant, five stations; nw. quadrant, nine stations.

29th, 7 a. m. Position, *north of Lake Ontario*: Departure, —.57 inch. Precipitation, ne. quadrant, three stations; se. quadrant, four stations; sw. quadrant, ten stations; nw. quadrant, three stations.

3 p. m. Position, *Upper Canada*: Departure, —.41 inch. Precipitation, ne. quadrant, one station; se. quadrant, one station; sw. quadrant, sixteen stations; nw. quadrant, no reports.

10 p. m. Position, *mouth of Saint Lawrence River*: Departure, —.29 inch. Precipitation, ne. quadrant, no reports; se. quadrant, five stations; sw. quadrant, seven stations; nw.

quadrant, no reports. From this region the depression moved thence eastward to the Atlantic.

XIII.—28th, 3 p. m. Position, *Province of Alberta, British America*: Departure, —.09 inch. Precipitation, ne. quadrant, no reports; se. quadrant, two stations; sw. quadrant, none; nw. quadrant, one station.

10 p. m. Position, *eastern Montana*: Departure, —.28 inch. Precipitation, ne. quadrant, two stations; se. quadrant, three stations; sw. quadrant, one station; nw. quadrant, no reports.

29th, 7 a. m. Position, *southern Dakota*: Departure, —.30 inch. Precipitation, ne. quadrant, five stations; se. quadrant, three stations; sw. quadrant, none; nw. quadrant, three stations.

3 p. m. Position, *southern Iowa*: Departure, —.35 inch. Precipitation, ne. quadrant, four stations; se. quadrant, three stations; sw. quadrant, one station; nw. quadrant, three stations.

10 p. m. Position, *southeast Missouri*: Departure, —.38 inch. Precipitation, ne. quadrant, seven stations; se. quadrant, one station; sw. quadrant, none; nw. quadrant, one station.

30th, 7 a. m. Position, *eastern Kentucky*: Departure —.44 inch. Precipitation, ne. quadrant, seven stations; se. quadrant, three stations; sw. quadrant, two stations; nw. quadrant, ten stations.

3 p. m. Position, *off Virginia coast*: Departure, —.53 inch. Precipitation, ne. quadrant, four stations; se. quadrant, no reports; sw. quadrant, two stations; nw. quadrant, thirteen stations.

10 p. m. Position, *off Long Island*: Departure, —.56 inch. Precipitation, ne. quadrant, five stations; se. quadrant, no reports; sw. quadrant, nine stations; nw. quadrant, five stations.

A description of this depression throughout the remainder of its course will appear in the REVIEW for December.

XIV.—29th, 3 p. m. Position, *Province of Saskatchewan, British America*: Departure, —.35 inch. Precipitation, ne. quadrant, two stations; se. quadrant, four stations; sw. quadrant, three stations; nw. quadrant, no reports.

10 p. m. Position, *Province of Assiniboia, British America*: Departure, —.41 inch. Precipitation, ne. quadrant, four stations; se. quadrant, two stations; sw. quadrant, none; nw. quadrant, four stations.

30th, 7 a. m. Position, *southern Dakota*: Departure, —.42 inch. Precipitation, ne. quadrant, eight stations; se. quadrant, two stations; sw. quadrant, none; nw. quadrant, four stations.

3 p. m. Position, *east Minnesota*: Departure, —.29 inch. Precipitation, ne. quadrant, five stations; se. quadrant, nine stations; sw. quadrant, five stations; nw. quadrant, six stations.

10 p. m. Position, *Lake Superior*: Departure, —.32 inch. Precipitation, ne. quadrant, no reports; se. quadrant, two stations; sw. quadrant, twelve stations; nw. quadrant, three stations.

A description of this depression throughout the remainder of its course will appear in the REVIEW for December.

NORTH ATLANTIC STORMS DURING NOVEMBER, 1886.

[Pressure in inches and millimetres; wind-force by Beaufort scale.]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to December 21, 1886.

Twelve depressions are traced, of which three, numbers 7, 9, and 12, passed eastward over Newfoundland; number 1 first appeared south of Nova Scotia, in about N. 37°, and

passed eastward, disappearing after the 2d; number 2 is first charted southwest of Iceland under date of the 1st, from which position it moved slowly southeastward until the 3d, after which date it circled northeast and passed beyond the region of observation by the 5th; number 3 apparently developed over the Bay of Biscay on the 6th and passed eastward; number 4 moved southeastward over the British Isles during the 8th and 9th, and was central over the Bay of Biscay on the 10th and 11th, after which it apparently circled northward and passed over England in a northeasterly direction during the 12th; number 5 is traced from the south of Newfoundland on the 8th to the northward of the British Isles by the evening of the 12th; number 6 originated southeast of Newfoundland on the 12th, and, following a generally northeast course, disappeared to the northward of the British Isles during the 15th; number 7 passed over the northern portion of Newfoundland during the early morning of the 6th, and, circling eastward, disappeared in the direction of the British Isles on the 19th; number 8 is traced from the coast of the United States, in the vicinity of Cape Cod, northeastward over Newfoundland, where it united with number 9 on the 20th; number 9 passed eastward over the northern portion of Newfoundland during the early morning of the 20th, and apparently dissipated over mid-ocean after the 21st; number 10 appeared over mid-ocean, in N. 45°, on the 23d, subsequent to which date it filled up; number 11 was central over mid-ocean, in N. 49°, on the 26th, after which it dissipated to the eastward; number 12 passed eastward over Newfoundland during the night of the 26th and disappeared in the direction of Scotland on the 28th.

The general character of the weather over the north Atlantic Ocean during the month was exceedingly severe, and terrific westerly gales, with tremendous seas, were reported by many trans-Atlantic vessels during the first half of the month. A large number of vessels arrived at American ports badly damaged by storms, and great quantities of wreckage were passed close to the coast, showing that a number of vessels must have foundered. A large portion of the debris passed consisted of petroleum barrels. Violent storms, occasioned by barometric depressions which passed over the eastern portion of the United States without advancing beyond the coast line, were experienced in the Maritime Provinces and over the ocean west of the sixtieth meridian. The first, and a portion of the second, decades of the month were marked by storms of great violence over the British Isles and adjacent waters. For the first decade five depressions are traced; for the second, three, and for the third, four; the tracks predominating east of the forty-fifth meridian. The general course of direction of the storm-tracks was north of east, the exception being number 4, which pursued an abnormal southerly course, afterwards circling northward.

In November, 1885, the paths of nine areas of low pressure were shown, three of which passed into the Atlantic from the American continent; two appeared on the Banks of Newfoundland, and one over the Gulf of Saint Lawrence; one occupied the ocean to the northwest of the British Isles during the 2d and 3d, and of the remaining depressions one apparently developed over the ocean between the coast of the United States and Bermuda, while one appeared in the vicinity of the Azores during the second decade of the month. The general direction of movement of the storm-centres was northeasterly or east-northeasterly, inclining to the southward after the storm-centres had passed to the eastward of the thirtieth meridian.

In November, 1886, the month opened with a depression central to the northwest of the British Isles and one to the southward of Nova Scotia; in the vicinity of the Azores the pressure ranged to about 30.34 (770.6). During the first six days of the month the barometer rose steadily over the western half of the ocean, but continued relatively low over the eastern half. On the 7th there was an appreciable decrease in pressure off the coast of the United States and the development or passage of a storm-area to the southward of Iceland was indicated.

From the 7th to the 10th, inclusive, severe storms were experienced over the ocean south of Nova Scotia and Newfoundland and over the British Isles and the Bay of Biscay and along the French coast, the pressure continuing high over mid-ocean. During the 11th, 12th, and 13th the area of high pressure moved slowly southeast in the direction of the Azores, making way for depressions which occupied the ocean to the northward until the 15th. From the 16th to the 20th the pressure was generally low over the entire ocean, with unsettled weather from coast to coast. From the 20th to the 27th the pressure was high over the British Isles and the ocean east of the twentieth meridian, while over the middle and western portions of the ocean the barometric fluctuations were frequent and marked. During the last three days of the month the barometric pressure increased over mid-ocean, which condition extended to the European coast by the 30th.

The following are brief descriptions of the depressions traced:

1.—This storm was central on the morning of the 1st in about N. 37°, W. 66°, with central pressure about 29.60 (751.8), whence it passed slightly north of east to N. 38°, W. 59° by the 2d, after which it apparently dissipated to the eastward.

The following special reports have been rendered relative to this storm:

Capt. W. A. Freethy, of the s. s. "Jeanie," reports a whole gale on the 1st from wnw., veering to n.; lowest barometer, 29.60 (751.8), at 11 p. m., in N. 35° 50', W. 70° 40'. Mate G. Cushing, of the bark "Neptune," Captain Beal, commanding, reports a strong nw. gale, commencing at 4 a. m. of the 1st, which continued until midnight; position at noon, N. 38° 22', W. 71° 10'. Mate Oliver Anderson, of the bark "Lilian B. Jones," Capt. E. F. Petrie, commanding, reports a strong gale from the w., beginning at 1 p. m. of the 1st, in N. 35° 12', W. 70° 42' (at noon); wind veered to nw. at noon of the 2d, in N. 36° 14', W. 70° 47', blowing strong gale, which increased to heavy gale during the p. m. and moderated at midnight; lowest barometer 29.53 (750.0). Capt. J. Beers, of the s. s. "Alliance," reports a whole westerly gale from the 1st to the 3d; position at noon of the 2d, N. 39° 32', W. 73° 45'.

2.—This depression was central on the 1st in about N. 59°, W. 27°, with pressure ranging below 29.00 (736.6), whence it moved slowly southeast to N. 55°, W. 21° by the 3d, accompanied by severe gales and an appreciable rise in barometric pressure. By the 4th the storm-centre had circled slightly north of east to N. 56°, W. 13°, thence passing northeast beyond the region of observation by the 5th.

The following reports exhibit the general character of this storm:

Chief Officer Miller, of the s. s. "Scandinavian," Capt. John Park, commanding, reports a strong gale from sw., veering to nw., from the 1st to the 3d; lowest barometer, 29.30 (744.2), at 8 a. m. of the 1st, in N. 53° 38', W. 23° 15'. The gale was accompanied by high seas throughout, and hard squalls and showers of rain at times. Capt. F. Bouchette, of the s. s. "Montreal," reports a heavy gale from s. to w. on the 1st; gale commenced at 9 a. m. and backed and veered in squalls, with heavy rain and high, confused sea, and veered to westward at 1 p. m.; position at noon, N. 55° 0', W. 16° 24', when barometer read 29.11 (739.4). Capt. S. Laub, of the s. s. "Thingvalla," reports a storm, attaining force 12, on the 2d; wind commenced from sw. and backed to sse., then veered to nw.; lowest barometer, 28.95 (735.3), at 5.30 p. m.; position at noon, N. 57° 37', W. 19° 17'. From 4 to 6 p. m. the ship's head was kept se., with stopped engines.

Capt. A. G. Braes, of the s. s. "State of Nebraska," reports a whole gale, which attained greatest force on the 2d at 2 p. m., in N. 54° 53', W. 21° 20', when barometer read 29.15 (740.4). Gale veered from s. to nw., and was accompanied by hard hail squalls in the afternoon of the 1st. Capt. Francis Bouchette, of the s. s. "Montreal," reports a hard gale during the 2d and 3d; at 6.30 a. m. the wind backed to s., blowing very hard, with high, confused sea running (position at noon, N. 54° 50',

W. $19^{\circ} 16'$; 1 p. m., furious squalls blowing with hurricane force; 4 p. m., wind commenced to veer to sw.; barometer 29.11 (739.4); 8 p. m., wind veered in a squall to w. by s.; barometer steady at 29.09 (738.9). On the 3d the wind veered to w. by n., with furious squalls, accompanied by hail and a high, confused sea; barometer rising; position at noon, N. $54^{\circ} 31'$, W. $21^{\circ} 43'$; at 1 p. m. a dangerous whirlwind passed to the north of the ship, churning up the water to a great height.

3.—The development of this storm to the southward of the British Isles was shown by vessel reports of the 5th, which indicated a depression subsidiary to number 2. By the 6th the area of low pressure was well defined over the Bay of Biscay, with strong gales to the northward and westward. By the 7th the depression had apparently passed eastward beyond the limit of reports.

The following reports refer to this storm, the one received from the s. s. "Lepanto" indicating that this vessel experienced gales in the southwest quadrant of number 2 and in the north-west quadrant of number 3.

Chief Officer Wise, of the s. s. "Lepanto," Capt. T. Irvin, commanding, reports a fresh wnw. gale during the 5th while in the English Channel, which continued until 4 a. m. of the 6th, in N. $49^{\circ} 55'$, W. $10^{\circ} 55'$ (at noon); lowest barometer, 29.42 (747.3), at 4 a. m. of the 6th. Mate F. Vogt, of the ship "Otto," Capt. W. Langen, commanding, reports a whole gale, with heavy wnw. squalls, hail, and rain, on the 6th, in N. $48^{\circ} 15'$, W. $19^{\circ} 0'$; barometer 29.77 (756.1) at noon. The s. s. "Sabara," on the 6th, in N. $51^{\circ} 10'$, W. $11^{\circ} 0'$, had a fresh gale from the northward, with high, confused sea; the ship labored and strained heavily, and the decks flooded fore and aft.

4.—This depression is first charted on the 7th in N. 59° , W. 15° , whence it moved southeast to N. 56° , W. 9° by the 8th. On the 9th it had passed southeastward over Ireland, and was central at noon (Greenwich mean time) in N. 51° , W. 6° , with heavy gales westward to the thirtieth meridian. By the 10th the storm-centre had moved into the Bay of Biscay, where it remained nearly stationary until the 11th, an increase in pressure being noticeable on the latter date. By the 12th the storm had apparently passed northward to about N. 50° , W. 5° , with central pressure about 29.50 (749.3), after which it disappeared beyond the region of marine reports.

The following special reports have been received from vessels which encountered disturbances within the area of this depression:

Chief Officer Wise, of the s. s. "Lepanto," Capt. T. Irvin, commanding, reports having experienced a strong to whole nw. gale, with mountainous seas and hurricane squalls, on the 8th, which continued throughout the 9th and 10th; ship's position at noon of the 8th, N. $49^{\circ} 30'$, W. $19^{\circ} 3'$; at noon of the 10th, N. $49^{\circ} 26'$, W. $22^{\circ} 22'$. Capt. T. Roberts, of the s. s. "Elstow," experienced a very heavy gale on the 8th, commencing at 4 a. m. and freshening gradually until midnight, when it was at its height; the wind being about nw. and backing to nnw. in squalls; position at noon, N. $50^{\circ} 57'$, W. $20^{\circ} 7'$.

Chief Officer Thorburn, of the s. s. "Bavarian," Capt. R. Leask, commanding, reports: "8th, in N. $51^{\circ} 12'$, W. $12^{\circ} 52'$ (at noon), a moderate gale began from the nw., with heavy squalls and high seas, increasing during p. m. to strong gale, nw., with violent squalls and high seas; continued through the 9th, in N. $50^{\circ} 38'$, W. $17^{\circ} 52'$ (at noon), veering to n., with violent squalls, rain, hail, and terrific seas flooding decks fore and aft; increased to heavy gale, n., in p. m.; lowest barometer, 29.48 (748.8), at noon; gale continued on 10th, in N. $49^{\circ} 48'$, W. $23^{\circ} 9'$ (at noon), veering to nne. at 9 a. m. and moderating after 4 p. m." Capt. W. Rea, of the s. s. "Bassano," reports a strong gale on the 9th and 10th from nw., backing to s., se., and ne.; lowest barometer, 29.17 (740.9), at noon of the 9th, in N. $49^{\circ} 39'$, W. $11^{\circ} 0'$. Capt. W. A. Beynon, of the s. s. "Belgenland," reports a strong gale from nw., veering to ene., during the 8th and 9th; lowest barometer, 29.24 (742.7), at 6 a. m. of the 9th, in N. $50^{\circ} 24'$, W. $14^{\circ} 47'$.

5.—This storm apparently developed off the coast of the

United States during the 7th, but was not sufficiently well defined to admit of accurately locating its centre until the 8th, when it was central in N. 43° , W. 55° , with pressure about 29.60 (751.8). From this position the depression moved slowly northeast until the 10th, after which its rate of progression was more rapid, and the storm-centre passed to the northward of the British Isles after the 12th.

The following reports indicate the general character of the depression, which showed a marked loss of energy after passing to the eastward of Newfoundland.

Capt. T. Roberts, of the s. s. "Samaria," reports a strong gale from se. veering to w. on the 7th; lowest barometer, 29.52 (749.8), at 8 a. m., in N. $42^{\circ} 30'$, W. $69^{\circ} 36'$. The gale was accompanied by high seas, fierce squalls, heavy rain, and much vivid lightning. Third Officer Prager, of the s. s. "Ems," Capt. T. Yüngst, commanding, reports a whole gale, with thunder and lightning, on the 7th; wind veered from sse. to nw., with snow squalls; lowest barometer, 29.59 (751.5), at 3.30 p. m., in N. $42^{\circ} 7'$, W. $63^{\circ} 36'$. Chief Officer Potts, of the s. s. "Palestine," Capt. W. Whiteway, commanding, reports: "7th, in N. $42^{\circ} 51'$, W. $65^{\circ} 46'$ (at noon); fresh to strong breezes from se., veering to s.; wind veered from s. to wsw. in p. m., and increased to strong gale at 3 p. m. (barometer 29.52 (749.8) at noon), with heavy rain and high seas, then veered to w., and continued strong to moderate gale until 6 a. m. of the 8th, in N. $42^{\circ} 26'$, W. $69^{\circ} 46'$ (at noon), then moderated, with clearing weather."

Capt. A. G. Braes, of the s. s. "State of Nebraska," reports a whole gale from sse., veering to w., during the 7th and 8th; lowest barometer, 29.82 (757.4), at 8.30 a. m. of the 8th, in N. $44^{\circ} 38'$, W. $54^{\circ} 55'$. The gale was accompanied by heavy rain and hail. Chief Officer Miller, of the s. s. "Scandinavian," Capt. John Park, commanding, reports a fresh gale from se., veering to nw., on the 7th and 8th; lowest barometer, 29.65 (753.1), at 6 a. m. of the 8th, in N. $43^{\circ} 22'$, $52^{\circ} 23'$. The gale was accompanied by very high cross seas, and veered from se. to nw. at 6 a. m. of the 8th, with heavy rain.

6.—This depression apparently developed southeast of Newfoundland, and was central on the 12th in N. 46° , W. 45° , with pressure about 29.70 (754.4), whence it passed northeast to N. 53° , W. 39° by the 13th, with an appreciable decrease in pressure; by the 14th the storm-centre had moved north of east to N. 55° , W. 25° , where pressure about 29.00 (736.6) was shown; continuing a north of east course the storm was central on the 15th in N. 57° , W. 12° , with evidence of great energy, whence it passed to the northward of the British Isles.

The following special reports refer to this storm:

Chief Officer C. H. Calvert, of the s. s. "Prussian," Capt. A. McDougall, commanding, reports a heavy gale on the 14th from w. veering to n. and backing to nw.; lowest barometer, 29.37 (746.0), at 8 a. m.; position at noon, N. $53^{\circ} 11'$, W. $28^{\circ} 8'$. Third Officer J. W. Mills, of the s. s. "Aurania," Capt. W. H. P. Hains, commanding, reports a westerly gale of force 7 to 8 on the 15th; lowest barometer, 29.15 (740.4), at 4.30 a. m., when one hundred and eighty miles west of Fastnet. Capt. G. de Kersabiec, of the s. s. "Normandie," reports a westerly gale of force 10 to 11 from the 14th to the 16th; lowest barometer, 29.17 (741.0), at 8.30 a. m. of the 15th, in N. $50^{\circ} 15'$, W. $16^{\circ} 20'$. Very high seas accompanied the gale, and the ship labored heavily.

7.—This depression passed eastward over the northern extremity of Newfoundland during the early morning of the 16th, and was central at noon (Greenwich mean time) of that date in about N. 51° , W. 53° , whence it moved eastward to N. 52° , W. 38° by the 17th, with pressure about 29.20 (741.7); from this position it passed northeast to N. 56° , W. 32° by the 18th, and circled southeast to N. 51° , W. 21° by the 19th, after which it was deflected to the northeastward and disappeared in the direction of the Scottish coast.

The following reports have been rendered relative to this storm:

Capt. W. Rea, of the s. s. "Bassano," reports a strong west-

erly gale from the 15th to the 18th, during which terrific squalls, with snow, sleet, and hail, were experienced; lowest barometer, 29.64 (752.8), at 8 a. m. of the 17th, in N. 44° 51', W. 49° 30'. On the night of the 17th, from 10 to 11.30 p. m., the ship was covered with electrical lights fore and aft. Capt. H. Perry, of the s. s. "Britannic," reports a strong westerly gale on the 17th, with violent squalls of wind and hail; lowest barometer, 29.39 (746.5), at 4 p. m.; position at noon, N. 46° 43', W. 47° 31'. Capt. G. de Kersabiec, of the s. s. "Normandie," reports a westerly gale of force 10 from the 17th to the 19th; lowest barometer, 29.57 (751.0), on the 17th, in N. 47° 48', W. 42° 30'. The disturbance began in a squall of snow from the w., and was accompanied by very heavy seas. Chief Officer Kinning, of the s. s. "Roman," Capt. D. Williams, commanding, reports: "19th, in N. 49° 55', W. 35° 36' (at noon), strong gale began at 11.30 p. m. from s., with heavy gusts; wind increased to a hard gale from s. in a. m. of the 20th, in N. 48° 48', W. 40° 33' (at noon), with heavy seas; at 10 a. m. the wind veered suddenly to nw. with heavy rain, and backed to w. in p. m., blowing strong gale with heavy squalls; veered to nw. in a. m. of the 21st and moderated; lowest barometer, 29.35 (745.5), at noon of the 20th."

8.—The presence of this depression over the ocean off Long Island was shown by vessel reports of the 18th, whence it moved eastward to N. 44°, W. 59° by the 19th, with central pressure about 29.20 (741.7); from this position it circled northeast over Newfoundland and united with low area number 9 on the 20th.

The following special reports refer to this storm:

Capt. W. A. Beynon, of the s. s. "Belgenland," reports a moderate gale on the 18th, from s. veering to nw.; lowest barometer, 29.33 (745.0), at 1 p. m., in N. 40° 46', W. 72° 20'. During the gale the barometer fell .20 in one hour; the wind shifted at 1.30 p. m., in a squall, with heavy rain from sw. to w. Chief Officer W. Scott, of the s. s. "Dunholme," Captain Wilkinson, commanding, reports a strong to whole gale on the 18th, in N. 38° 0', W. 71° 0' (at noon); wind veered from s. to w. at 6.30 p. m.; lowest barometer, 29.53 (750.0), at 8 p. m.; gale continued, veering to wnw. during the 19th and 20th. Capt. E. Orcutt, of the bark "Don Justo," experienced a heavy gale from ssw. veering to wsw. on the 18th, in N. 42° 30', W. 70° 30'. The gale was accompanied in the morning by heavy rain, thunder, and lightning, and during the afternoon by snow-squalls; barometer 29.67 (753.6) at 7 a. m. The gale continued strong, wsw., through the 19th, in N. 42° 35', W. 70° 35'; barometer 29.47 (748.5) at 7 a. m., then rising.

Capt. H. Perry, of the s. s. "Britannic," reports a fresh gale on the 19th in N. 42° 57', W. 59° 1' (at noon). Gale set in from s. at 4 a. m., with heavy rain, and veered to wnw. at 8.30 a. m.; at 4 p. m. backed to w., with violent squalls of wind, hail, and sleet; lowest barometer, 29.21 (741.9), at 8 a. m.; gale continued from w. during the a. m. of the 20th, and barometer rose slowly. Chief Officer Seomba, of the s. s. "Cephalonia," Capt. H. Walker, commanding, reports a strong to whole s. to w. gale on the 19th in N. 42° 37', W. 64° 48' (at noon); wind veered to w. at 2.30 a. m.; lowest barometer, 29.55 (750.6), at 4 p. m. Capt. W. Kühlewein, of the s. s. "Gellert," reports a heavy gale, with high seas and squalls, on the 19th; barometer fell to 29.49 (749.0); position at noon, N. 41° 9', W. 66° 0'.

9.—This storm passed eastward over the northern portion of Newfoundland during the early morning of the 20th, with evidence of great energy and strong gales southward to the fortieth parallel; by the 21st it had moved rapidly eastward to N. 50°, W. 36°, where a marked loss of strength was apparent; after this date the depression apparently passed eastward and dissipated over mid-ocean.

The following special reports have been received relative to disturbances encountered during the passage of this depression:

Capt. H. C. v. d. Zee, of the s. s. "Zaandam," reports a storm on the 20th and 21st from sse., veering to w.; lowest barometer, 29.38 (746.2), at 1.20 a. m. of the 21st, in N. 49° 24',

W. 34° 25'. Capt. J. J. Bravens, of the s. s. "De Ruyter," reports: "20th, in N. 48° 49', W. 32° 56' (at noon), in the morning wind sse., blowing fresh and squally; 2.10 p. m., barometer 29.77 (756.1); 6.10 p. m., barometer 29.59 (751.6), wind a whole gale from the s., with a very high sea from wsw. and s.; brought the ship to; 10.10 p. m., barometer 29.51 (749.5), wind a whole gale from s. by w., with a very high sea; 11.10 p. m., barometer 29.42 (747.3); gale moderating from sw." Capt. G. de Kersabiec, of the s. s. "Normandie," reports a westerly gale of force 10 to 11 from the 19th to 21st; lowest barometer, 29.45 (748.0), at 9.30 a. m. of the 21st, in N. 43° 35', W. 54° 47'. The sea was monstrous from the west, washing over to the height of the bridge and funnels, and the ship labored heavily.

10.—This depression is charted for one day only, vessel reports of the 23d locating its centre on that date in about N. 45°, W. 37°; from this position it apparently passed northeast and dissipated.

The following special reports indicate its general character.

Capt. M. de Jousselin, of the s. s. "La Bretagne," reports a strong gale during the 23d and 24th; lowest barometer, 29.69 (754.0), at 11 p. m. of the 23d, in N. 49° 15', W. 33° 0'; wind veered from s. to n. Capt. R. Teed, of the bark "Kate Caun," reports a moderate to strong gale on the 23d and 24th, commencing from sw. on the 23d, in N. 39° 21', W. 36° 19'; wind backed to s., with high seas at noon, when barometer stood 29.42 (747.3) and increased to strong gale, s., in a. m. of the 24th, veering to sw. and moderating in p. m.

11.—This storm appeared over mid-ocean, in N. 49°, W. 26°, on the 26th. The depression advanced from the westward, but was not sufficiently well-defined previous to the 26th to admit of accurately locating its centre; subsequent to the date for which it is charted the storm moved east or north of east and disappeared.

The following reports have been made in connection with this storm:

Capt. Edward Bentley, of the s. s. "Wisconsin," reports a fresh westerly gale on the 25th and 26th; lowest barometer, 29.70 (754.4), at midnight of the 25th, in N. 47° 40', W. 41° 30'. Commodore W. G. Randle, commanding the s. s. "Westernland," reports a strong sw. to nw. gale from the 25th to 27th; lowest barometer, 29.62 (752.3), at 1 a. m. of the 26th, in N. 44° 42', W. 34° 30'.

12.—This depression passed north of east over Newfoundland during the 26th, and was central at 12 noon (Greenwich mean time) of the 27th in N. 52°, W. 39°, without evidence of special strength; fresh gales were, however, reported to the southward; by the 28th the storm-centre had moved northeastward to N. 56°, W. 21°, accompanied by fresh to strong gales; from this position the storm passed to the north of Scotland by the 29th.

The following special reports refer to storms encountered within the area of this depression:

Capt. H. Parsell, of the s. s. "Adriatic," reports a strong gale on the 26th, from s. veering to wnw.; lowest barometer, 29.64 (752.8), at 8 a. m., in N. 42° 13', W. 62° 0'. Capt. John Jenkins, of the s. s. "Ripon City," reports a whole gale from s. veering to wnw. on the 26th and 27th; lowest barometer, 29.30 (745.5), at 8 a. m. of the 27th, in N. 51° 0', W. 37° 0'.

On the 27th the s. s. "Westernland," in N. 48° 15', W. 42° 55' (at noon), encountered a huge sea at 2.45 p. m. The wave rose just ahead of the ship and fell on the bow like the bursting of a water-spout. Twenty-nine feet of the whaleback was crushed in, and four seamen were immediately killed; sixteen others of the crew and steerage passengers were more or less injured, and in a few hours two other deaths occurred. The ship's position at the time this wave was encountered was in the southwest quadrant of the area of low pressure, and it is probable that, owing to the relative shallowness of the depression, the wave was generated by a subsidiary whirl, and partook of the nature of a water-spout.

Capt. B. Gleadell, of the s. s. "Germanic," reports a strong

gale from the 27th to the 29th; wind veered from s. to nw.; lowest barometer, 29.99 (761.7), at 10.30 a. m. of the 28th, in N. 51° 15', W. 21° 0'. Capt. J. J. Small, of the s. s. "Bolivia," reports a whole gale from s. veering to nw., continuing from the 27th to 29th; lowest barometer, 29.43 (747.5), at 11 p. m. of the 28th, in N. 55° 20', W. 17° 02'.

OCEAN ICE.

The only iceberg reported during the month was observed on the 2d, in N. 45° 20', W. 45° 26', from the s. s. "Elstow," the berg being from fifty to sixty feet high.

In November, 1885, the only iceberg reported during the month was observed in N. 48° 00', W. 51° 10'. In November, 1884, several icebergs were seen in N. 45° 56', W. 52° 38', but none were reported in that month of the years 1882 and 1883.

FOG.

The following shows the limits of fog-areas encountered on the north Atlantic Ocean during November, 1886, as reported by shipmasters:

1st.—The s. s. "Virginian," in N. 43° 26', W. 49° 5' (at noon), encountered a dense fog at 3 a. m., which continued until 6 p. m., with fresh breeze from s. veering to nw. in p. m.

3d.—The s. s. "Ems," had a dense fog from N. 47° 3', W. 43° 16' to N. 46° 38', W. 44° 43', with easterly winds.

4th and 5th.—The s. s. "Tyrian," on the 4th, in N. 42° 10', W. 47° 7' (at noon), had a dense fog setting in at 10 a. m., which continued until 10 a. m. of the 5th, in N. 42° 5', W. 52° 28' (at noon), with variable winds.

6th and 7th.—The s. s. "Palestine," on the 6th, in N. 43° 50', W. 59° 55' (at noon), encountered a dense fog at 9 p. m., which continued until 2 a. m. of the 7th, in N. 42° 51', W. 65° 46' (at noon), with strong breezes veering from se. to s.

7th.—The s. s. "Bulgarian," in N. 48° 10', W. 42° 7' (at noon), had dense fog from 5 to 8 p. m., with moderate, variable breezes.

8th.—The s. s. "Iowa," in N. 44° 18', W. 52° 44', (at noon), entered a dense fog at 2.45 a. m., which continued until 5.45 p. m., with fresh sse. breezes. The s. s. "Bulgarian," in N. 46° 13', W. 47° 32' (at noon), had dense fog from 11 a. m. to 2 p. m., with fresh se. breezes.

15th.—The s. s. "Cephalonia," in N. 46° 47', W. 44° 16' (at noon), at 4.30 p. m. dense fog set in and cleared off at 7.30 p. m., with strong sw. breeze. The s. s. "Bavarian," in N. 43° 40', W. 50° 43' (at noon), had dense fog from 7 a. m. to 11.30 a. m., with wind sw., veering at 10 a. m. to w., in fresh gale. The s. s. "Prussian," in N. 52° 16', W. 33° 42' (at noon), had dense fog from 4 p. m. to 7 p. m., with moderate sw. winds.

From above reports it will be seen that fog was encountered in the localities given during November, 1886, with moderate winds blowing from the southern quadrants, which would seem to indicate that conditions favorable for the development of fog during this month would exist to the eastward of barometric depressions, with southerly winds and barometric pressure about, or slightly above, the normal.

WATER-SPOUTS.

The officers of the s. s. "Energia" report having observed a huge water-spout about half a mile ahead of them while a little below Wolf Trap Light, Chesapeake Bay, about 3 p. m. of the 25th. It came towards them from a northeast direction, and looked very threatening; finally it moved away to the southwest, where they saw it pass over to the land near the Wolf Trap, where it burst and the water went down in torrents.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to shipmasters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during November, 1886, five reports con-

cerning storms encountered by vessels in the Atlantic west of the forty-fifth meridian. Four messages were sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for November, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. On chart iv the departures from the normal temperature are illustrated by lines connecting stations of normal or equal abnormal values.

In New England, the middle Atlantic states, and North Carolina the mean temperature of the month is slightly above the normal; the departures in New England average 1°.8, and in the middle Atlantic states 1°.6; the largest departures in excess of the normal are at Boston, Massachusetts, excess 3°.2, New London, Connecticut, 3°.2, and Philadelphia, Pennsylvania, 3°.1. With the exception of the small section of country mentioned, the temperature of the air over the United States has been colder than the average November; the departures are quite large in the middle plateau, the middle slope, and in Oregon. At one station, Salt Lake City, Utah, the temperature is 7°.9 below the normal. West of the eighty-fifth meridian nine stations, only, show an increase of temperature, at six of these the increase is less than one degree; the other three are Leavenworth, Kansas, increase 3°.8, Rio Grande City, Texas, 2°.6, and Saint Louis, Missouri, 2°.5.

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for November.

Districts.	Average for November, Signal-Service observations.		Comparison of Nov., 1886, with the average for several years.
	For several years.	For 1886.	
New England.....	40.7	42.5	+ 1.8
Middle Atlantic States.....	45.4	47.0	+ 1.6
South Atlantic States.....	55.0	54.7	- 0.3
Florida Peninsula.....	66.2	64.0	- 2.2
Eastern Gulf States.....	55.5	54.5	- 1.0
Western Gulf States.....	56.4	55.7	- 0.7
Rio Grande Valley.....	65.2	66.4	+ 1.2
Tennessee.....	48.2	47.6	- 0.6
Ohio Valley.....	43.2	41.8	- 1.4
Lower Lake region.....	38.8	37.8	- 1.0
Upper Lake region.....	34.2	33.1	- 1.1
Extreme Northwest.....	25.2	23.7	- 1.5
Upper Mississippi Valley.....	38.5	37.7	- 0.8
Missouri Valley.....	34.7	34.0	- 0.7
Northern slope.....	31.9	29.2	- 2.7
Middle slope.....	36.5	35.7	- 0.8
Southern slope.....	49.2	48.8	- 0.4
Southern plateau.....	47.4	44.4	- 3.0
Middle plateau.....	37.7	30.9	- 6.8
Northern plateau.....	37.8	32.9	- 4.9
North Pacific coast region.....	45.8	42.5	- 3.3
Middle Pacific coast region.....	53.3	52.3	- 1.0
South Pacific coast region.....	59.2	56.8	- 2.4

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.		Below normal.	
Leavenworth, Kansas.....	3.8	Salt Lake City, Utah.....	7.9
Boston, Massachusetts.....	3.2	Las Animas, Colorado.....	5.9
New London, Connecticut.....	3.2	Winnemucca, Nevada.....	5.7
Philadelphia, Pennsylvania.....	3.1	Boise City, Idaho.....	5.4
Rio Grande City, Texas.....	2.6	Prescott, Arizona.....	5.4
Saint Louis, Missouri.....	2.5	Fort Maginnis, Montana.....	4.9
New York City.....	2.5	Denver, Colorado.....	4.7
Washington City.....	2.0	Pike's Peak, Colorado.....	3.9

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature, are given in the table of miscellaneous meteorological data.